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COURSEWORK TITLE: HUMAN-COMPUTER INTERACTION

COURSEWORK CODE: COMP1649

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DEVELOPING A SNORKELERS AND AMATEUR SCUBA DIVERS INTERACTION SYSTEM FOR BOTH LAND AND UNDERWATER

1 Introduction

In this assignment, is to create a prototype of scuba divers and snorkelers for both land and under water is going to be designed. This assignment shall therefore explain some functionalities of snorkelers and amateur scuba divers including taking videos and pictures of underwater experience, tracking and viewing diving activities, using their mobile application. Additionally, assignment will also focus on mid-fidelity, low-fidelity and high-fidelity prototype for scuba divers and snorkelers. Moreover, this assignment will also discuss human computer interaction research, interaction theory, design process, conceptual design, design principles, prototype and research study.

2 Background literature

Definition

Background literature is a list of individual reviews of book and articles, which makes a complete set as a literature review. In sciences, they are widespread and highly important. A critical, analytical assessments and synthesis of state of knowledge about subject is called literature review. Rather than summarising all theories, finding. Separately, it must compare and relate them. In order to organise review, it must also have certain themes or focus. It doesn't have to be comprehensive summary of every article written about subject. However, it ought to go over all of more noteworthy scholarly work pertinent to such topic.(Harvey, n.d.).

According to(Sinha et al., 2010) Human-computer interaction, is a behaviour which focuses on assessment, creation, and use of interactive computer system for people to utilise while studying the world around them. Scuba diving is part of tourism and leisure industry which influence local environment and economies for both developed and developing nations. (Lucrezi et al., 2019).Because maritime environment is secured, snorkelling is a well-known leisure activity on coral reefs throughout the nations, particularly in marine environments. (D. Den Haring, 2016). Because of functionality of intended scuba diving shall be determined by application of interactive process design.

2.2 Human Computer Interaction Research

Deepblu

Deepblu is user-friendly application for logging dives, which accepts divers to explore and plan dive trip using reviews from fellow user. It also allows direct dive bookings with local dive shops through application. Deepblu do simplify process by automatically generating dive logs through syncing with their dive computer using Bluetooth. Additionally, you can share your underwater pictures and videos with Deepblu community. This application is compatible with wider range of dive computers, and all you can do is download the free Deepblu application on your mobile device to get started.(admin, 2019).

Diveboard

Diveboard is a no-costs scuba logbook application which allow you to upload your dive information, like dive profiles, photos, marine life you've encountered, and details about your diving companionship. It also gives shop locator features helping you find nearby dive shops. You can simply obtain this application for free from both the Google Play Store and application Store.(admin, 2019).

As shown above these are some of the products which have already been made and we are going to use some of the requirement in the development of my prototype.

2.2.1 Human Computer Theory

User-centered design is a valuable method for enhancing user experience in interactive system. This method place users at the core of design process, ensuring their needs, preferences, and agenda are met. Designers mostly engage users throughout UCD, involving them in different stages gaining insights into users behaviour by methods like user research, usability testing, and iterative designs. This iterative process allow designers to continually reprocess their designs based on user feedback. UCD's primary aims to create software which gives seamless, intuitives, and easily tangible user experiences. Another effective method for enhancing user experience in interactive systems is implementations of interactive techniques and interface. Systems which are interactives, responsive, and increases user satisfaction and engagement. Thanks to ways like natural language processing, gesture recognitions, and direct interactions, users may engage with system in more intuitive and organic method. These interactive interface make it possible for users to finish task efficiently, enhancing overall experience(R et al., 2023). User-centered design is integral to our scuba diving app's development. We prioritize user needs through research and iterative testing to create an app that aligns with user preferences, resulting in a more satisfying and intuitive experience.

Within realms of Human-Computer Interaction, accessibility emerges as a critical element. Its primary purpose is to make sure interactive systems do cater to diverse user base, including individuals with disabilities. HCI experts stick to inclusive design principles, ensuring people with visual, hearings, motor, or cognitive impairments can use interactive system effectively. This approach promote technology access to all, irrespective of their abilities. In same way, aesthetics and visual design play a vital role in value user experience with interactive device. HCI professionals focus on crafting interface which not only look nice but also evoke positive emotion. They accomplish this through designing interface which is intuitive, engaging, and visually logical, drawings from designing principles like visual hierarchy, color theories, and typography. When interface is visually appealing, it automatically encourage users to interact with system, resulting into overall improved user experiences.(R et al., 2023). To increase accessibility in our scuba diving app, we will ensure compatibility with screen readers and assistive technologies, use a clear and well-structured layout, implement keyboard navigation, and offer customizable font sizes and high-contrast options. These measures will make the app more user-friendly for a diverse range of users, including those with disabilities.

Another HCI theory is Cognitive psychology. According to (Khakshour, 2015) is study of how people do perceive, learn, remembers, and process information is known as cognitive psychology. A cognitive psychologist may investigate perceptions of various shapes, reasons behind recalling certain facts whilst forgetting others, or language acquisitions. We plan to apply this concept in our next application. We acknowledge that when users come across icons associated with specific functions, they typically remember certain attributes. Therefore, the scuba diving app will feature icons designed to evoke users' memories.

They are types of interactions that we will discuss and this involves; menu selection, (*Interaction Styles*, n.d.) A menu is a collection of options that are shown on the screen; selecting and using one or more of the options causes the interface to change in state. The user chooses a command from a predefined list of commands listed in menus using a system based on menu selection, then they watch the result. Users can complete tasks with minimal learning if labels on menus and commands are clear and organised properly. This is because locating a command or menu item is a recognition task rather than a recall memory task. The scuba diving app will have menus as one way users will use to interact with system.
According to my understanding Design patterns in HCI are recurring solutions to common design problems, helping improve the usability and user experience by offering established approaches to address specific design challenges. They encourage consistency and best practices in interface design. This including knowing the layouts that sits well with users, to avoiding conflicts.

3. Design Process

Human computer interactions design, design thinking process share similar agenda and step in its process, observing and understanding user in determining problem, ideations and prototyping, testing and also pursuing iteration process to refine ideas(Park and McKilligan, 2018). The report includes design process of the prototype of Snorkerlers and scuba divers.

3.1 Conceptual Design

According to my understanding a conceptual model is like a big-picture idea of a system. It's a simplified way to represent any kind of system, whether it's a computer system or a business process. This model isn't for actually building the system; it's just there to help you grasp how the system works and how its parts come together.

One of the way that we will use to present our conceptual design is a **use case.**

Use case

Requirements

- Must allow users to take photos
- Must allow users to take videos
- Must allow users to view files
- Must allow users to monitor air in tanks and time
    - Must allow users to check time remaining for diving under water
    - Must allow users to save files

3.1.2 Design Principles

Design principles are produced, formalize and codify design knowledge to innovative archival practice which can be communicated, used in advancing design science, solve future problem designs, especially challenges faced by cross cutting market all over. Principles are rules, guidelines and strategies to be followed when developing interactive system (Fu et al., 2016).

Availability, meaning all functions in website must be available to everyone all times without restrictions which prevents users from interacting with website. Availability do enable great flow to users.

Consistency, this needs web page look and operate same way. Elements having similar function must look identical to make users know they are operating similar thing without knowing. Its vital that distinct flows have similar motive functions same way. Flow must also display similar results making users not get confused with results(Polasanapalli and Buggareddy, n.d.).

Flexibility, website must respond to various users respectively. Web page must easily be understood by both new and old users, must operate with user's actions.

Familiarity, interactive system must apply context which are similar to end user. It must minimise time to users in accessing website**.**

Directness, allowing direct paths to perform task on interactive system accomplished through rendering possible alternatives clearly. The user interface designer could start evaluation process modification of user interface configuration, feature attributes, action through referring to graphical explicitly representations, compared to navigation through alternative representation(Polasanapalli and Buggareddy, n.d.).

Aeazsthetics, plays major role in HCI, this is visual appearance for product, impacting user experience of interface in different ways, when user visit application, aesthetic attracts user and dis focus them if visual attractiveness of application is not according to user expectation.

4. Prototype

Prototypes are visual or physical objects which may have different forms like sketches, physical three dimensional object and digital models. Prototype represents design idea for end user product and subcomponents of potential end product, process of engaging with product experience with product, like storyboards represent user process of interaction by medical device interface, whilst virtual reality could be used in simulating procedure involving novel medicals device(Coulentianos et al., 2022).

1.1 Low-fidelity prototypes

These are paper based hence don't allow user interaction. Arranged from hand drawn mock up to print outs. They are easier to create, helping to enable early visualisation of alternative solutions of design that provokes innovations and improvement. Additionally rough sketch help user feel very comfortable suggesting change(Affairs, 2014).

1.2 Mid fidelity

Mid fidelity prototype reduces cost of development project through testing functionality ideas cheaply. They are effective communications tool internally, and supply network firm(Khadjehali, 2017).

1.3 High-fidelity prototypes

They are computer based, mainly allows mouse keyboard user interactions. They take you close to true representation of user interface. High fidelity prototype are much effective in collection of true human performance information and demonstrating real product to users and management(Affairs, 2014).

In conclusions snorkelers and scuba diver's system shall be developed in mid fidelity and AZURE RP9 is software to be used. This software allows developers to design prototypes.

5. Research study

Aim

The main aim is to design mid fidelity prototype for snorkelers and scuba divers using Azure RP9 software which allows divers explore under water, should be able to take pictures, videos and view them on land.

1.4 Data collection

Data acquisition is discovering, generating new data set. Data labelling is adding annotations to data in order that machine learning mighty learn from those(Whang et al., 2023).

Below are the techniques for data collection

1.4.1 Interview

Interview is gathering data face to face to collect right data through asking various people using unstructured and structured questions on snorkelers and scuba diver's system shall be used in appendix.

1.4.2 Questionnaires

This is research strategy used to collect demographic data and client's attitude's to discover mainly what influence the products functionalities are operating from the users of system, where clients find challenges to operate prototype because of age, background. Interview shall be semi structured and survey shall be given to different group of people and it shall comprise survey questionnaire to collect right data.

1.4.3 Observation

This monitoring necessary facts which do define prototype depending on how effective it operates, it supports clients mission that is collected by observing, identification of customer's behaviour which got missed during survey and interview. Qualitative data shall be gathered through direct observation in monitored atmosphere, hence gathering and managing data by observation could be hard and structured shall be employed.

Interview questions have been produced in appendix 1.

1.4.4 Target audience

Target audience include both professional and amateur snorkelers and scuba divers who are experienced and not experienced.

1.4.5 Data analysis

Quantitative data

This is method of using numerical values obtained from observation in order to explain phenomena which observation could reflect on them, employing empirical statement and evaluation to determine degree or norm is fulfilled in program(Taherdoost, 2022).

Qualitative data

This is study of things in natural setting attempting in making sense of, interpret in terms of interpretations brought to them by users, how they make use of their world, experience obtained whilst using your product(Guest et al., 2013).

6. Conclusions

During this assignment, I actually have been able to come up with system of snorkelers and scuba divers for underwater and also be used on land carrying amateurs along the system. I also have managed to come up with human computer interaction research, human computer interaction theory, design principles, the prototype and research study as well as conclusion. Shortfalls I encountered during this assignment includes dragging of internet leading in delays in getting right information which we are given specific deadline. Secondly the issue of having no electricity for almost twelve hours in the midst of the assignment and yet I have a laptop which switches off immediately electricity is gone and yet I was working towards having prototype and design. For direction in the future on producing this prototype, I would recommend someone coming up with system which has security, and time must be prioritised.

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Appendix 1.

Structured Interview questions

1. Is the application easier to use? Give reason
2. Is application hard to use? Give reason
3. Are icons complicated to convert? Give reason
4. Does type of snorkelers and scuba diver's system meet client's requirement?
5. Is there error noticed by customer?
6. Is there any feature that should be implemented?

Appendix 2.

Observations

1. Is the user finding it hard to use application?
2. Noticing how users make use and convert icons and link
3. Observing features mostly used and unused features
4. Observing errors which application has and how they affect user.

Appendix 3.

Screenshots for Prototype

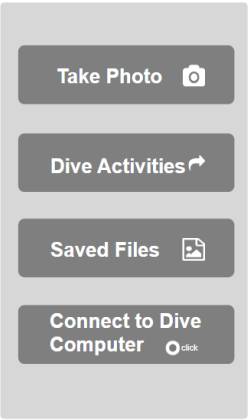

Figure 1 above shows the home page of application where divers can take photos.

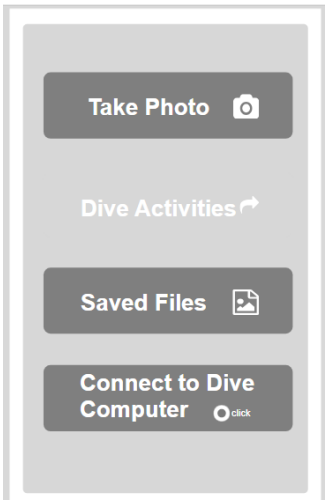

Figure 1.1 shows divers searching diving activities

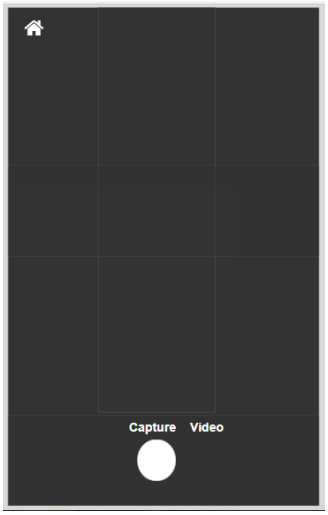

Figure 2 above is shows application allowing divers to capture photos

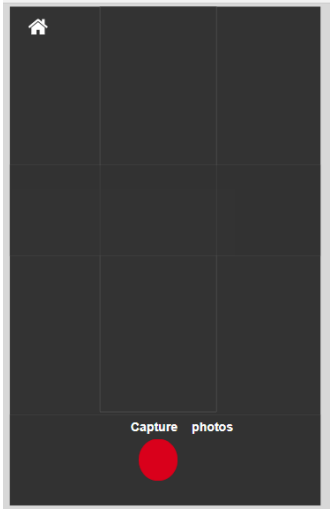

Figure 3 shows divers can be able to take videos using their mobiles.

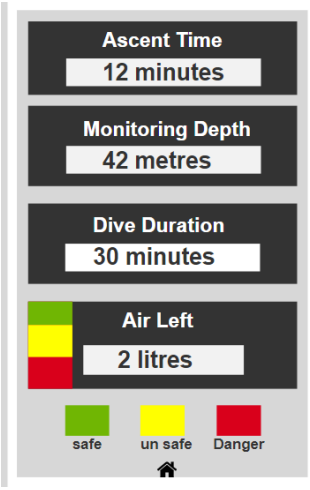

Figure 4 shows diving activities where divers can be able to monitor time, depth, dive duration, and amount of air left in tank. The green colour shows divers have enough air in tanks, yellow colour is showing air has reduced hence not safe and red colour shows they are in danger air left is very little.

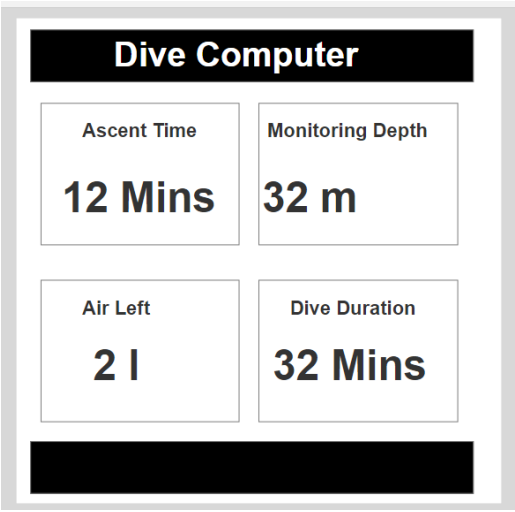

Figure 4 above shows the diving activities, amount of time left in minutes, monitoring depth in meters, air left and dive duration in minutes.

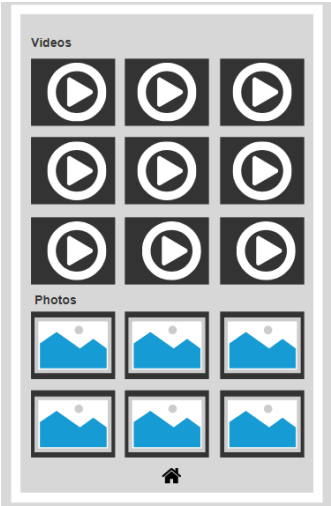

Figure 5 shows saved files of divers on mobile application.